A New Prescription: Pollution Prevention Strategies for the Health Care Industry

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Proceedings

Section 4: Dental Facilities

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Removal of Mercury from Dental Amalgam Wastewater

Abstract

Dentists, when either placing new or removing old "silver" fillings generate a considerable amount of waste amalgam. This may be in the form of chunks, small grindings, or slurry of fine grindings water. Most of this is vacuumed from the patients' mouths and eventually sent down the drain into the office wastewater.

Municipalities, including King County, have found that a significant percentage of mercury discharged to the sewer systems originates from dental office effluent. This amalgam wastewater exceeds King County sewer discharge limitations for mercury by three to four orders of magnitude.

Technological source control solutions do exist and are available to dental offices. However, there are concerns about the effectiveness, ease of use and cost of these devices. Overcoming these and other barriers are essential to creating new pollution prevention behaviors that keep dental mercury from the municipal waste streams and reroutes it to reclamation.

This paper evaluates these concerns from the viewpoint of both local government technical assistance providers and a practicing dentist. Practical aspects of choosing to remove and reclaim mercury as well as selecting and using these devices will be presented.

Devices available to dentists range in their effectiveness and cost. This paper evaluates methods of treating dental wastewater to separate amalgam particulate from the liquid fraction of the wastewater. The metals removal capacity of commercially available equipment from two manufacturers was investigated. We also designed, built and demonstrated metals removal capacity of a simple, inexpensive settling system. In addition to technological issues, behavior change principles are being applied to outreach efforts. Data from this study are being used to help determine best management practices for dental amalgam wastewater.

All three pieces of equipment tested show one to four orders of magnitude decrease in mercury concentration and loading after treatment. Removal rates average 95-99% depending on equipment used. In the case of the commercial equipment, our data verifies manufacturer’s claims for removal rates of around 99%. For our own piece of equipment, we see that a simple, inexpensive settling chamber can achieve removal rates in the 90-95% range and retain that ability over an eight month testing period.

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Some of the criteria for evaluating the suitability of a system include: effectiveness, simplicity of operation and design, level of handling of waste material required of office personnel, "'fail-safe" mechanisms designed to avoid accidental spillage, system for handling proper recycling of material, and cost. While not all barriers to preventing mercury pollution have been over come, we have begun to address major concerns. Systems are in place in King County for proper collecting, transporting and recycling the mercury waste. Mercury removal from amalgam wastewater is recommended before discharge to the King County Metro sewerage system. We are seeking voluntary compliance from the dental community.

Introduction

In the past twenty-five years, sewer utility pretreatment programs have successfully addressed discharge from large generators, (significant industrial users -- SIUs), to the sewer system. These industries are regulated, permitted and monitored. Currently about 15% of the pollutants to the sewer can be attributed to the big generators. The remaining 85% is from households, small businesses (conditionally exempt small quantity generators CESQGs), and non-point sources, such as stormwater (Galvin, 1991).

Programs, such as King County Local Hazardous Waste Management Program in Washington State, have been developed to address the household and small business hazardous wastestream. Like other pollution prevention and source control programs, our purpose is to assure reduction of hazardous materials going into the municipal wastestream, to reduce the hazardous materials discharged to the environment through landfills, and sewage effluent and biosolids. Whether biosolids go into land application, as in King County, or are incinerated, source control is necessary to prevent hazardous material from accumulating and dispersing through the soil, water or air.

This program works with many industry types to develop best management practices, provide on site consultations and assist businesses in reducing hazardous waste. In addition to the dental profession, some of these are print shops, photo processors, automotive repair, auto-body shops, dry cleaners, machine shops and marinas.

Why Dental Waste?

Why were we concerned with dentists? Initially, King County was required by Washington Department of Ecology to prioritize the elimination of occasional spikes in the concentration of mercury going to King County's two main treatment plants. Other considerations were the presence of metals, such as mercury and silver, in wastewater treatment byproducts, including biosolids for agricultural use and effluent for non-potable water reuse programs. Source control of contaminants -- preventing metals and other possible pollutants from entering the sanitary sewer system in the first place -- is a priority in US Environment Protection Agency, Washington

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Department of Ecology and King County policies (The federal Clean Water Act; Washington State Water Pollution Control Law; Washington State Hazardous Waste Reduction Act; King County Ordinance No. 11034).

Thermometers, barometers, switches, fluorescent tubes, mercury boilers, manufacture of mirrors, dental amalgams, latex paint, pesticides and the electrical and instrument industries are among the potential sources of mercury (The Merck Index, 1989). In the King County service area there were no permitted significant industrial users (SIUs) generating significant levels of mercury. Industrial laundries, which may use limited amounts of mercury as a biocide, are regulated through pretreatment permits. All permitted discharges are restricted to a mercury limit of .2 parts per million. Mercury as a biocide in paints has been largely phased out and a review of studies on potential household product contributions did not indicate significant sources of mercury from this sector (Galvin, 1991; Rourke, 1991; Dickey, 1990-91; Jenkins and Russell, 1990; and Gurnham et al., 1979). Of the remaining sources, dental offices appeared to be the most likely potential source of mercury in the publicly owned treatment works.

Of the several hazardous wastestreams discharged from dental offices, we have focused this paper on amalgam wastewater, and, in particular, mercury. Although the other metals are of concern, mercury is present in the highest concentrations, is most toxic and has the lowest discharge limits (in King County).

Mercury Cycle In Dentistry

How does mercury from dental amalgam actually get into the environment? The dental industry consumes perhaps 100T of Hg annually, though that figure is diminishing. It's made into amalgam in the dental office. Then a number of things can happen that lead to it entering the environment [Figure 1]. Excess mixed amalgam that is not actually used in a filling or is carved away should be saved and recycled by the dentist. Some, perhaps, ignore this, and it ends up in the trash and eventually a landfill or incinerator. Hopefully that doesn't happen very often. Extracted teeth with amalgam fillings in them end up in trash or medical waste - again, landfill or incineration. Crematoria have been shown to produce a significant amount of mercury vapor from incinerated remains. But the most significant avenue that we're talking about at this conference happens when amalgam fillings are placed or removed and particles, chunks, dust, or slurry get vacuumed up by the chairside dental vacuum system. Bigger chunks are caught in a chairside trap, and presumably this trap gets periodically cleaned out and the pieces saved and later recycled. Any of you who are dentists know, however, that the dental staff often may take the easy way and simply throw this in the trash or wash it out in the sink - down the drain. Most of what is vacuumed up is in smaller particles or slurry, which passes right through the chairside traps and heads for the office wastestream. This is the part we're particularly interested in today. How much is it, really, and how can it be stopped?

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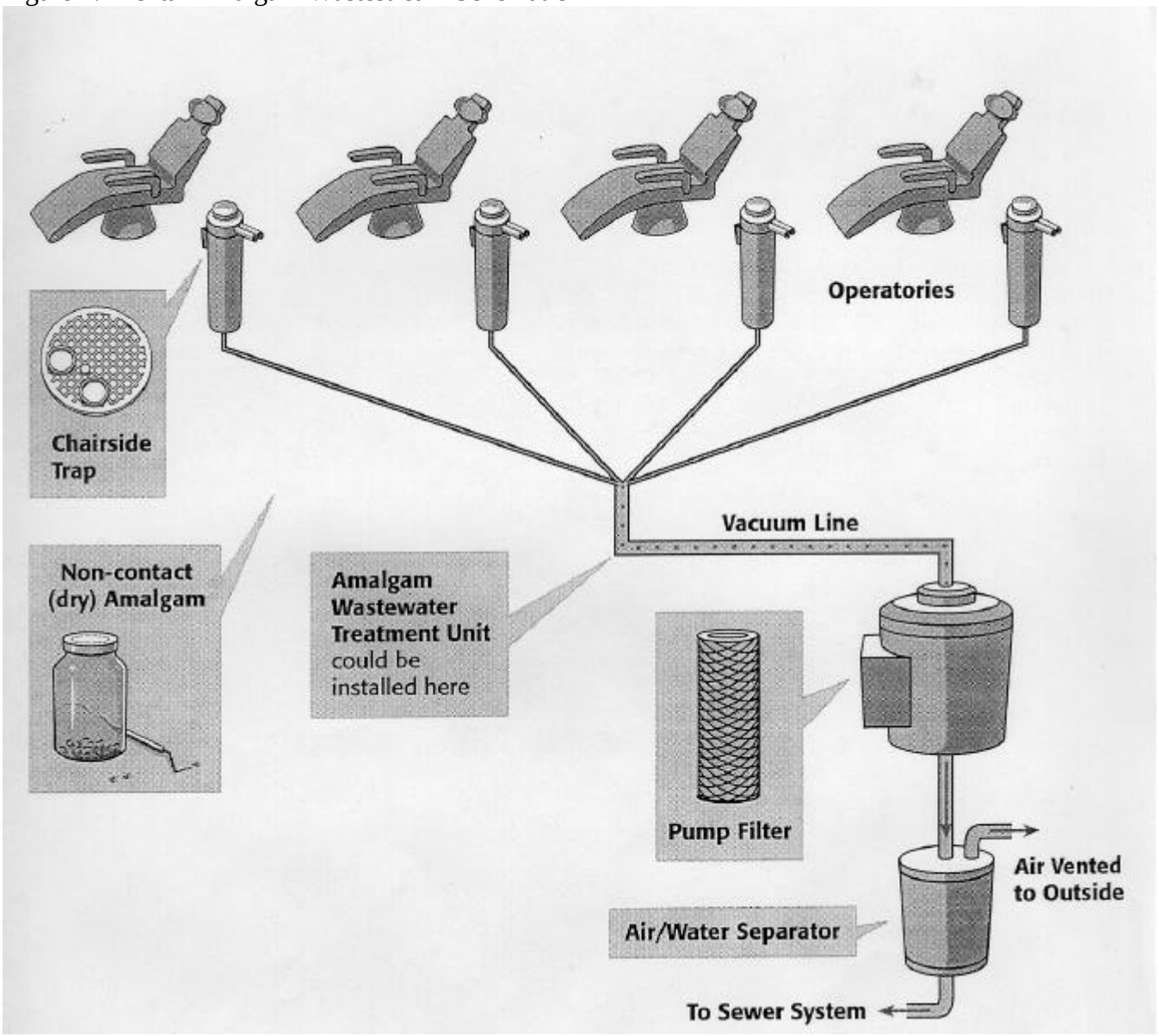
Figure 1. Dental Amalgam Wastestream Schematic



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How Much Mercury?

In 1990, when we began this project, very little was known about dental waste. To appropriately address this waste, we needed to quantify and characterize it. We sampled the wastewater leaving the dental chair, and surveyed dentists to help determine quantities and types of wastes. Dental amalgam is made up of about 40-50% mercury, 25% silver and the rest is copper, zinc and tin. The results of sampling and surveying showed mercury concentrations of 100 – 2000 mg/L. The two long lines on the left side of the graph show the mean and standard deviation of mercury in untreated wastewater from dental operatories. [Figure 2.] This exceeds our 0.2 mg/L local mercury limit by 500 to 10,000 times. The portion of the mercury to the King County sewerage system from dentists was conservatively calculated at about 14% or 52 pounds per year. (Welland, 1991)

Other sewer districts have done similar studies. Minneapolis St. Paul found that an even greater proportion of mercury to the treatment plants, 76-80%, is from dentists. (Berglund, 1998). Differences in these results may stem from such factors as other sources of mercury, slightly different sampling methods, variability of samples, analytical difficulties and quite conservative assumptions on our part.

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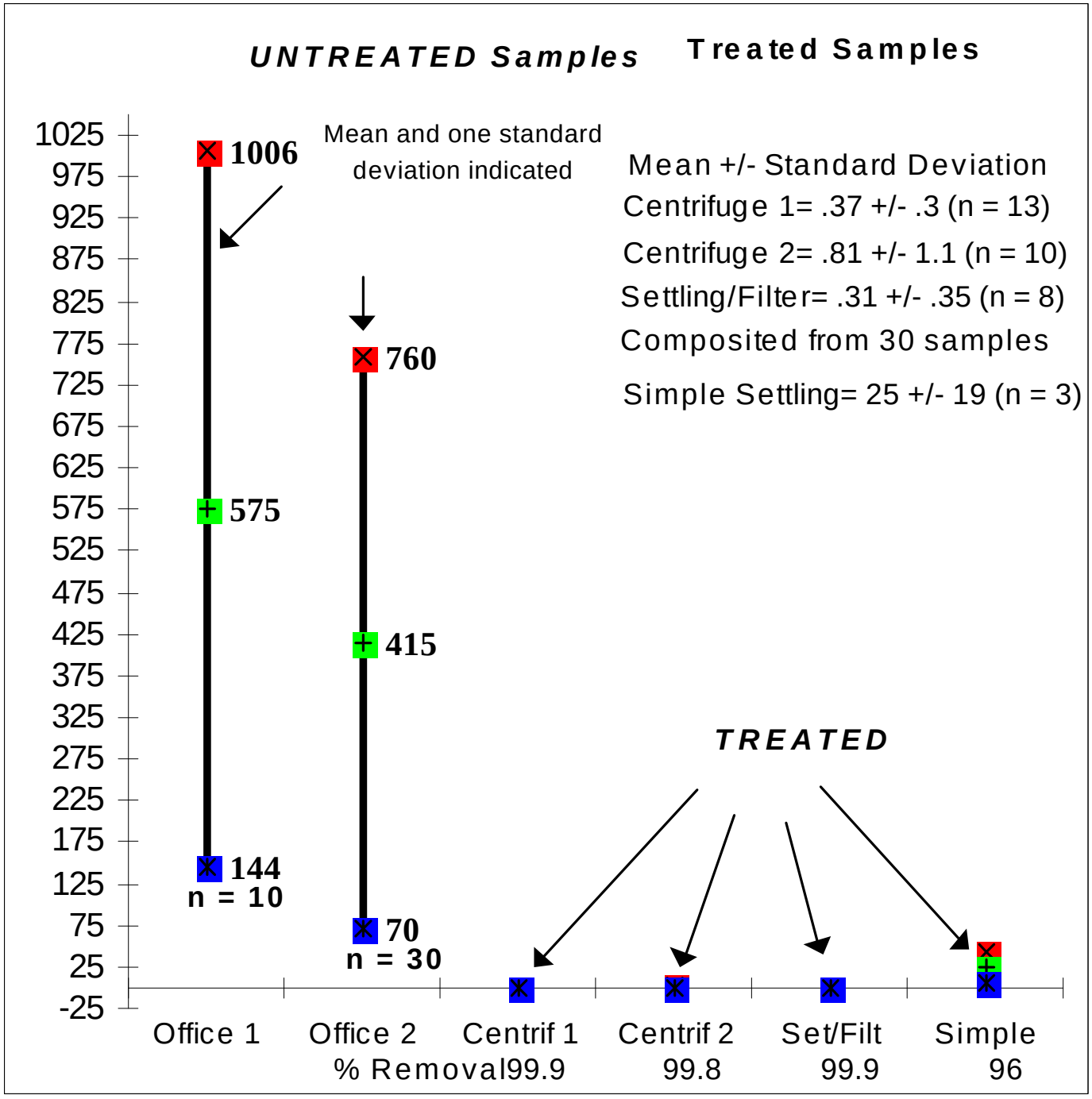
Figure 2
Mercury in Dental Wastewater
Loading to Sewer in mg/day



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Approach

Cooperation

From the beginning of this project we have worked with the local dental community. In 1990, we established an advisory board to explore dental waste issues and to help with a characterization study. We have continued with many joint meetings, waste management articles in the dental journal, talks and paper co-presented and joint development of best management practices (BMP's). Cooperation on waste management issues and outreach have been key.

Voluntary Compliance versus Formal Rulemaking

A local Hazardous Waste Disposal Rule for Dentists was proposed in October 1994. This rule would have required all area dentists who discharge to the King County POTW to install amalgam wastewater pretreatment units. During the public comment period the local dental community articulated their concern about further regulation of dental office waste disposal practices, citing such issues as costs, newly developing products and services, and unsubstantiated environmental damage. In addition, the local dental community expressed a willingness to work voluntarily toward reduction of their contribution of hazardous substances to the waste stream.

Instead of promulgating a rule for dentists, King County developed a program for working cooperatively with the dental community. King County has three long-term goals for compliance, based on the expectation that this voluntary approach continues to be embraced by the local dental community and our agency.

- First, institutionalization of waste management and reduction techniques in all dental practices, including reclamation of mercury and silver resources from amalgam wastes and x-ray fixer.
- Second, the inclusion of information about dental waste management and reduction in all formal training programs for dental professionals in this geographic area.
- Third, to document a measurable decrease in the amount of metals discharged to the sewer system from dental offices in King County.

King County and the Seattle-King County Dental Society have established an open, responsive and reasonable working relationship that has contributed to the success thus far of this voluntary approach to waste management by dental offices in our area. Although interest is increasing, voluntary compliance has been slow. Approximately 1% of King County's 1500 dentists have installed amalgam separation devices.

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Overcoming Obstacles

We have encountered many obstacles or barriers while moving toward better management of wastes from dental offices. We have also seen a tremendous increase in interest and solutions to difficult issues. Issues include perception of problem, costs, technology and service availability.

Acknowledging there is problem depends on having reliable information about the waste and about regulations. It also depends on being ready to address the problem areas. Characterizing dental waste showed both agencies and dentists how much mercury is in dental amalgam wastewater. Although philosophical approaches to protection of the environment vary, and questions have been posed about what environmental damage is being done, a great many dentists are concerned about our environment and about doing what's right. The realization is growing that region by region, sector by sector, everyone is being called on to eliminate or reduce hazardous wastes. It is this attitude, that we all have a part to play, and the desire to be part of the solution, that overcomes the perception, common to every regulated business, of being over regulated, of being picked upon. Although some dentists may personally have no problem discharging amalgam waste, many are recognizing the problem and want to individually, and as a profession, demonstrate a pro-active response.

Responsible hazardous waste management is being noticed. A King County recognition program, EnviroStars, provides recognition to businesses for their efforts to protect the environment. Currently, 36 dentists have been recognized as EnviroStars. In addition, Dr. Rubin has received a Washington State Governor's Award, the first dentist to ever do so.

Costs

Complaints about cost of proper disposal are frequent since incorrect disposal of waste to the sewer may have no initial direct cost to the discharger. Proper disposal may cost more up front, but reduces liability and, as we all become more aware of total cost accounting, we realize the future costs of today's behavior.

Pollution prevention is based on a hierarchy of eliminating, reducing, reusing or recycling wastes. Preventing pollution is very cost effective. The next step is source control. Once a pollutant has been generated, controlling it as close to its source as possible is generally the most effective and cost effective way of managing it. Once we accept that proper waste management and disposal are necessary, the task is to make it as convenient and cost effective as possible. Our program has taken a multi level approach to help dentists control costs. We valuated existing amalgam separation technology, developed inexpensive, effective technology, encourage the development of more technological options, stimulate the vendors to provide convenient waste management services at a realistic cost, provide information and free onsite consultations, modify regulations

to provide more flexibility, and provide incentives – vouchers up 50% or $500 for services or equipment, to reduce hazardous waste.

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Technology

To evaluate methods of separating amalgam particulate from liquid wastewater, King County tested the mercury removal capacity of two commercially available separator units and one easily fabricated settling unit. The tests were performed in dental offices. Manufacturers' claims of 99 + percent removal during standard testing were compared to results obtained in operating dental offices under local conditions. Testing was conducted for filtration, settling, filtration and settling, and centrifugation amalgam wastewater treatment equipment. The goal of testing the amalgam wastewater treatment units was to find out if treated amalgam wastewater met King County's local sewer discharge limit of 0.2 milligrams per liter total mercury. All operatories in this study used vacuum-suction only rather than cuspidor systems, reflecting the practice of the majority of dental offices in this region.

Results from the three amalgam wastewater treatment units are shown in Figure 2. The four points on the right side of the graph represent treated wastewater and show remarkable removal rates. All values are expressed in mercury loading (milligrams mercury per day). The loading figures show the weight of mercury discharged per day, independent of water dilution, disinfectants or any other materials.

The three tested units are shown on the graph as follows: mechanical centrifuge (centrif 1 and centrif 2), settling/filtration unit (set/filt) and a simple, fabricated gravity-settling unit (simple) designed by a King County chemist and a process engineer – see Appendix 6). The graph shows one to four orders of magnitude reduction in mercury after treatment of amalgam wastewater.

Significant reductions of mercury in the sewer discharged waste stream of dentists are achievable. The commercial equipment reduced mercury by 99.9%. Even very basic treatment, such as that provided by the "homemade" King County model (less than $100 per unit), removed at least 95 percent of the mercury from rinse waters. While high levels of reduction are feasible with treatment, it was not demonstrated that 0.2 ppm mercury could be consistently achieved with the equipment tested. Chemical treatment in addition to physical amalgam removal did produce wastewater with a mercury concentration of less than 0.2 ppm. (Tomchick, 1998).

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Demonstration Testing for Vendors of Amalgam Wastewater Treatment Units

Dentists requested some sort of treatment equipment "approval" by King County to assist them in assessing amalgam wastewater treatment units. While King County does not recommend specific equipment, a testing protocol was developed in 1995 to demonstrate whether a system consistently removes at least 90 percent of mercury under typical conditions that include, but were not limited to the standard practice use of in-line amalgam screens and traps.

Demonstrations included installing the unit in representative dental offices. Requirements for the sampling report also included the vacuum drop associated with the amalgam wastewater treatment unit - stated both objectively (inches of Hg via gauge) and subjectively by dental office personnel. In addition, the reclamation or disposal of collected sludge and the method of infection control had to be explained. Finally, a description of the attention required by the vendor or dentist for proper operation and maintenance of the unit had to be provided [see appendices 3 and 4.]

Service

A major gap in the amalgam management issue was the question of reclamation. In 1990, the county had only one hazardous waste drop-off option that was available once a month for a fee of about $30 per gallon. It requires self-transportation, and has only one location. The material was handled as hazardous waste, and not reclaimed. Reclamation of amalgam slurry required more preparation than solid amalgam particles. Shipping to distant reclaimers had limitations as well. Also dentists really wanted a pick-up service, preferably of all wastes -- hazardous and bio-medical. Currently there are more services available, several mail-in services for solid amalgam exist, one pick-up service, and amalgam separator companies usually provide reclamation service as well. In a further effort to stimulate the local market and initiate new waste management habits of dental clinics, King County and the local dental society are sponsoring a dental waste pickup project which must include amalgam waste. Vendors are encouraged to provide pick-up for multiple waste streams and dentists are encouraged to use these services regularly. The county pays for the first pick-up. Three vendors have expressed interest, and the dental society will do the promotion and register dentists. King County will collect follow up information about the effectiveness of the project.

What Makes A Good System?

Let's look at this diagram again [Figure 1]. It looks like it ought to be fairly simple to trap this stuff. Well, it is and it isn't. You can't just stuff some kind of filter in the line somewhere and have it work successfully. I'd like to point out some of the difficulties. Although there's not a

lot of volume of water flowing through, it is flowing at a high rate of speed and force, mixed with large quantities of air. The speed and force are such that a simple filter is not likely to capture very much. Or, if the filter were dense enough to trap the sludge material, it would reduce the suction power so much at the chairside that it would be unacceptable. Besides the technical difficulties in designing an effective system, there are also behavioral factors. Since dentists are not yet very sold on this problem or highly motivated to make changes, anything that interferes with their routine or diminishes the effective use of their existing equipment will meet strong resistance. Most designs now incorporate some means of slowing down the flow to a trickle that can be effectively filtered, without diminishing the suction power. This is usually accomplished with some type of air/water separator tank. The vacuum pump is allowed to pull at the same force. The liquid portion of the evacuant drops into a holding tank or container where it can then drain or settle through a filter. The air whooshing through the line is vented to the outside of the building. This is required by code in any newer offices. It should be pointed out that this air contains a significant amount of mercury vapor, as demonstrated in a paper published a couple of years ago (Rubin, 1996, see appendix 2). That's a whole other issue, and we're not addressing that in today's presentation. At this point, most designs incorporate a filtration or settling process, or a combination. A couple of companies have tried using a centrifuge design to separate the heavier metals from the liquid. Here is an example of one system that uses air/water separation and a filtration system. There are a lot of companies who have put a lot of effort into designing systems that will do the trick. Having seen most of them, tested several of them in my own office, and worked with these systems for the last eight or nine years, I have learned a lot about what works, what doesn't and why. I'd like to list for you what I feel are essential elements of an ideal mercury capturing system for a dental office or clinic.

1. The system should be **effective**. That's the whole point of this. It should be able to prove that it can remove 90-99% of all the mercury, regardless of particle sizes in the amalgam sludge. At least two municipalities, King County in Washington State, and Minneapolis have tested several companies who have been willing to put their products through some testing protocols. It does matter how the testing is done. These two municipalities have done a great job, and I think their results should be looked at more closely than what the manufacturers' claim.

2. There should be **no compromise in suction power**. If you just cram some kind of dense filter inline with the vacuum pump, the effectiveness of the vacuum at chairside is going to drop, as I have mentioned. Again, this would be an unacceptable compromise.

3. **"Hands-Off"** feature. If this material is toxic and nasty (which it is), it's not a good idea to have a system where the dentist or staff has to frequently empty containers, decant off liquids, or handle or change filters. Ideally a system just sits there and does its job without much fuss or handling by the staff. Again, if it's difficult, the staff eventually won't do it, unless they are

highly motivated. Then there will be a system supposedly in place that's really not functioning at all.

4. **Recycling.** It's not enough to capture this stuff - it needs to be recycled in order to get it out of the loop and keep it out of the environment. The handling of the recycling is not simple, but it's not quite as impossible as it was a couple of years ago. The dentist needs to know how to prepare, package and send the collected material to a certified recycler and refiner of mercury. Who will take this stuff? How can it be shipped? Who is liable for it once it leaves the office? Can liability fall back on the dentist if there's a problem of improper handling somewhere down the road? Past case history indicates that's possible. It's difficult, but not impossible, for the dentist to find a way to handle this. It's much easier if the company that sold the unit also handles the recycling end of it. Some of the companies offer this service, and I'd recommend sticking with a company or dealer that does include doing this for you, with all the proper regulations and paper trail of liability adhered to. If a company just wants to sell you a system and leave you on your own to figure out recycling, I don't think that's a very good service. How often the collecting and recycling is done will depend on the design of the system.

5. **Simplicity** of design is a plus. The fewer moving parts and bells and whistles, the fewer things that can go wrong. Easy installation and easy maintenance means fewer problems and lower costs.

6. **Quiet operation** is a nice feature, though these units are usually installed far away from where staff or patients are.

7. There should be a **"Fail-Safe"** mechanism. What would happen if something clogged the line, or the filter got full too soon, or something like that. Are you going to have a toxic spill on your hands? Could it end up shutting down your vacuum pump? Some effective type of bypass design should be able to automatically handle these eventualities. These units are usually installed in an out of the way location, not often checked or seen by the office staff.

8. The unit should **install centrally**. Looking back at the office diagram,[Figure 1.] if there are filters set at chairside in each treatment room, they can capture all the new amalgam sludge. But all these connecting lines, all the way to the vacuum pump, are caked with years of buildup of amalgam sludge, prophy paste, saliva and crud, like arteries clogged with arteriosclerosis. Clean water passing through these lines is going to continue to pick up mercury and pass it along into the waste stream. This has already been demonstrated (Rubin, 1996). If you install a unit centrally, at the site of the vacuum pump, it will effectively clean the whole wastestream before dumping into the sewer system.

9. **Reasonable cost** is always important. Realize that you'll be paying for a system as well as for some means of periodic recycling. It's a good idea to compare companies on the total cost of having a system over a five or ten-year period, in order to really see how much it will cost.

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We have prepared handouts that outline these features (appendix 1), as well as a list of some known manufacturers who have demonstrated a passable level of effectiveness with testing protocols through King County Industrial Waste Division (appendix 5).

Summary

Acknowledging that mercury discharge from dental offices is significant is an important first step to properly managing dental waste. Technological, logistical, financial and emotional concerns have been, and continue to be addressed by both the county and dentists. We have developed some solutions and BMP's cooperatively, and continue to get information to those who need it. The government may be able to provide information and education, possibly incentives and recognition. But it is you, the dentist, who can make the real difference. We encourage dentists, and any dental societies or organizations, to take the opportunity to act proactively on this matter, helping to protect the environment and gaining some good community relations at the same time. One professional organization, the International Academy of Oral Medicine and Toxicology (also called IAOMT) has taken as stand. Through its Standards of Care committee, it has recommended that all its members who are practicing dentists install proper mercury recapturing systems now. This is an excellent opportunity for individual dentists, and for dental organizations to lead the way to a cleaner, healthier environment.

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Appendices:

Appendix 1. Elements Of An Ideal Mercury Recovery System

1. **Effective** - 90-99%

2. **No compromise in suction power**

3. **"Hands-Off"** operation

4. **Recycling** provided by vendor as part of service

5. **Simplicity of design** - easy installation and maintenance

6. **Quiet operation**

7. **"Fail-Safe"** mechanism to prevent blockage, leakage, etc.

8. **Central installation** rather than at chairside

9. **Reasonable cost** - look at total cost, including periodic recycling cost

We recommend that you ask questions of prospective vendors until you are satisfied. If possible, try to talk with some existing customers as references.

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Appendix 2.

Mercury Vapor in Amalgam Waste Discharged from Dental Office Vacuum Units

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Abstract. Clinical procedures in dental offices generate quantities of waste slurry or fine particulate matter, much of which is derived from dental amalgam filling material. This mercury-containing material is discharged into waste streams via the dental office vacuum pump system. This system also discharges large quantities of air, either into the atmosphere exterior to the office building or into the sewer system, depending on the type of equipment used. The purpose of this study was to investigate whether the discharged air contained mercury vapor.

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DENTAL AMALGAM RESTORATIONS ("silver fillings") have been the most widely used fillings for more than 160 y. These fillings contain approximately 50% mercury (Hg). Elemental Hg vapor has been shown to escape from these fillings in the mouth.1-9 Skare and Engqvist 10 reported recently that the number of amalgam surfaces was related to the emission rate of Hg into the oral cavity and to the excretion rate of Hg in urine.

Some amalgam "scrap" is generated in dental offices when amalgam fillings are placed or removed. The scrap is typically composed of small chunks of amalgam material, a slurry of grindings of extremely small particles, water, and saliva. The scrap is removed from the patient's mouth with a chairside suction or vacuum device that is powered by a vacuum pump located in a more remote part of the office or building. A mixture of the amalgam waste, containing Hg, water, saliva, and other debris, travels through pipes and tubing to the vacuum pump, where it is eventually discharged into the waste-water line that leads to the municipal sewage system. In some offices, the air and liquid portions of the evacuant are separated in an air/water separator tank. The liquid and solid materials are drained into the wastewater while the air is vented elsewhere, usually to the outside of the building. Questions have been raised about the ultimate fate of this amalgam slurry and the possible environmental impact of its contents, particularly Hg.

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Seattle, Washington

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If Hg vapor can be released from the amalgam in the human mouth, it is also possible that the vapor could be released from the amalgam scrap. Little information is available about such a possibility. We, therefore, studied air samples collected from eight sites at which air is discharged externally from the dental office vacuum systems.

Material and Method

A total of eight sites were selected within and around the city of Seattle, Washington, for this study. The sites were numbered randomly from one to eight. A single dentist occupied some of the dental offices, whereas others were located in buildings in which a central vacuum pump served several dentists' offices. Some vents were located on the tops of buildings, and others were housed a few feet above ground level. Site five had a vent located approximately 1.5 m from the ground in an alley, and it was proximal to car and foot traffic.

A one-time "spot" air sample was taken at each of the discharge vents, and the concentration of Hg was determined three times during a 1 - to 2-min period. in addition, Hg release during an entire day was studied at site one; air samples were taken periodically at 30-min intervals from 7 A..M. to 5 P. M.

Concentrations of Hg were determined with a Jerome 431 -X mercury vapor analyzer (Arizona Instrument Company [Phoenix, Arizona]). This instrument was designed for the accurate analysis of Hg vapor in the workplace environment, for locating Hg spills, and for studies of intra-oral Hg vapor levels. In the presence of Hg vapor, a thin gold film undergoes an increase in electrical resistance proportional to the mass of Hg in the sample. Sample air is filtered to remove any acidic gases that might interfere with the sensor's response to Hg. The features of the analyzer are the following: range = 0-0.999 mg Hg/ml, resolution = 0.001 mg/m3, and accuracy = ± 5%. Air is drawn into the analyzer for 12 s at a flow rate of 750 cc/min. The manufacturer calibrated the instrument for us, and it was sent directly to us immediately prior to this study.

We did not conduct any direct measurements of air volume discharged at these sample sites, but we obtained the manufacturer's specifications regarding volume flow for the different types of vacuum units. This information was used to estimate the total daily discharge of Hg, based on the determinations of the Hg vapor concentrations.

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Discussion

Spot-sample determinations and results of the 17 samples collected during an entire day at site one were similar (i.e., 0.103 versus average of 0.094 mg/m3, respectively [Table 1, Fig. 11). The "spot" sample appeared to be a valuable indicator of an individual office's Hg discharge level.

The levels of Hg vapor were higher in older dental offices, compared with newer facilities. Relatively high levels of Hg were detected at older office sites, even when no patient was being treated at the time of measurement. This suggested that Hg vapor was being released from amalgam residues that existed somewhere in the office plumbing. In one office, a piece of plumbing no longer in use (i.e., an old separating tank) released 0.332 mg/ml Hg vapor, thus implying that Hg vapor could be released from the static residue of amalgam sludge. A simple turbulence of air and water over existing amalgam slurry also seemed sufficient to cause release of Hg vapor. The environmental or health risks of this level of emission is not known. For purposes of comparison, the Occupational Safety and Health Administration (OSHA) cites an 8-h time-weighted average (TWA) Hg exposure limit for humans in the workplace at 0.050 mg/m3, The OSHA also has an ,acceptable source impact level" of 0.2 pg./ml for nonalkyl Hg vapor.

Perhaps the total quantity of Hg released in a given period of time is relevant. We could not measure outflow volume of air directly at the test sites. A rough estimate could be made, based on manufacturer's specifications. For the types and brands of vacuum pumps seen in this study, we estimated a flow rate of 0.5 to more than 5.0 ml/min. An attempt was made to correlate this information with the test data, making some assumptions on the running time of the pumps per day (they typically run continuously all day), per year, per dentist, etc. The total quantity of Hg released per day per dentist in these test offices was estimated to be 60 mg. Extrapolation of that result to 112 000 U.S. dentists," who work at least 200 d each year, led us to conclude that the total quantity of Hg released nationwide each year may exceed more than a ton. A more widespread study and careful volumetric analysis are needed to obtain a more accurate picture.

Whether Hg vapor levels exist-and to what degree -in sewage systems that receive discharge air directly still remains uncertain.

We would expect the discharge amounts to be similar to the levels reported in this study, but the significance of occupational exposure to workers in that environment is a question for further study. Table 1, Fig 1.

Before this study, no data had been published about escape of Hg from dental waste material, under naturally occurring conditions. Release of Hg in our study occurred, absent any extremes of forces or temperatures; therefore, such a result appears to be cause for some environmental concern.

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Table 1.—Concentration of Mercury (Hg) Vapors in Air Samples Collected at Test Sites

Site no.	No. dentists at office site	Concentration (mg Hg/m^3)
1	2	0.103 ± 0.011*
2	1	0.013 ± 0.001
3	5	0.237 ± 0.020
4	2	0.010 ± 0.001
5	10	0.168 ± 0.023
6	2	0.060 ± 0.011
7	2	0.023 ± 0.003
8	4	0.126 ± 0.001
Average concentration		0.092 ± 0.008

*Concentration values presented as means ± standard deviations.

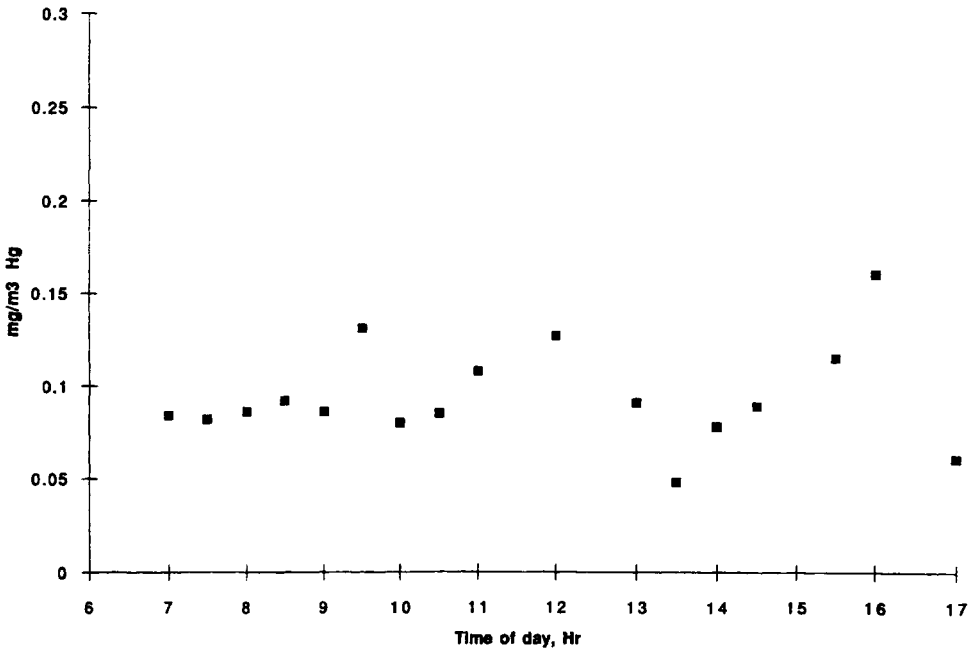

Fig. 1. Results of Hg analysis for air samples collected at site one during a day, from 7:00 A.M. to 5:00 P.M.

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Results

All the air samples collected for analysis contained, on average, 0.092 mg Hg/m3. The level of Hg, however, varied markedly with sampling site and ranged from 0.010 mg/ml to 0.237 mg/m3 (Table 1). Mercury levels were higher in samples collected at sites of older dental offices than in samples obtained at newer offices. The two sites at which the lowest concentrations were found (sites two and four) were at newer offices that contained newer plumbing systems. No attempt was made to record the type of dental procedures that were performed on patients at the time the samples were taken. Some samples were obtained at times during which there was no active-dental treatment being performed by dentists.

The results of Hg analysis for air samples collected from 7:00 A.M. to 5:00 P.m. at site one are shown in Figure 1. During the day, a continuous output of Hg from this particular site was observed. Mercury levels ranged from 0.048 to 0. 160 mg/m3 (average = 0.094 m m3).

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Appendix 3. Testing Protocol for Amalgam Separation Equipment

Demonstration Testing of Amalgam Wastewater Treatment Units

Goal: To consistently demonstrate a minimum of 90 percent removal of MERCURY from amalgam wastewater under representative conditions.

Each vendor interested in installing amalgam wastewater treatment units within Metro's service area must demonstrate to Metro that the system will consistently remove at least 90 percent of mercury under typical conditions*. This demonstration must include installing the unit in representative dental offices. (For the period July 1, 1994 to May 1, 1995 'representative dental offices' must include a minimum of three King County dental offices). Vendors must provide Metro with both a description of the specific testing conditions associated with each demonstration dental office and the Monitoring Plan for the demonstration period. The Monitoring Plan should include: (a) a diagram and photo showing sampling location and treatment unit placement in relation to chairs and vacuum pump; (b) composite sampling procedure; (c) sample splitting procedure; (d) sampling handling procedures; and (e) number of samples.

Based on Metro's experience in characterizing wastewater from dental offices and the performance of pretreatment systems in other settings, the following are minimum demonstration requirements:

1. ESTABLISH SAMPLING POINT. In most cases the sampling point will remain constant throughout the test period, therefore advance consideration for the location of the sample point in relation to the installed unit must be considered. The point of sampling will usually be located between the operatory chair and the vacuum pump, but in all cases sampling must occur before amalgam wastewater mixes with water that will not be treated by the amalgam wastewater treatment unit.

2. SAMPLE TO ESTABLISH MERCURY CONCENTRATION IN UNTREATED WASTEWATER. Prior to the actual installation of the amalgam wastewater treatment unit, sampling must consist of a minimum of five continuous weeks of operation to establish a mean weight of discharged mercury (in grams) based on weekly mercury concentrations and wastewater volumes. For each amalgam removal unit, a minimum of one composite sample per week must be collected totaling a minimum of 5 composite samples prior to installation. Each weekly analysis must consist of all the representative composite samples (one or more) taken that week. For each sample, the total volume of wastewater and the volume of the sample must be reported. Total weight of mercury can then be calculated. Each sample must be analyzed by an EPA or WDOE certified laboratory for total mercury using EPA Method 7470 (or equivalent, e.g. Method 245. 1). Please refer to "Recommended Sampling Protocol for Dental Amalgam Wastewater".

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3. INSTALL THE TREATMENT UNIT. The treatment system must be installed in a minimum of three dental offices for each type of vacuum system (wet vs. dry) for which certification is sought. The offices should be those which routinely work on several amalgam placements or removals per day.

4. SAMPLE TO ESTABLISH MERCURY CONCENTRATION IN COLLECTED SLUDGE AND TREATED WASTEWATER. Following installation of the treatment unit, the total grams of mercury collected over the five week post-installation test period must be reported based on the total weight of the collected solids and its mercury concentration.

5. In addition, for those treatment units installed upstream of the vacuum pump, treated wastewater must be collected. Sampling shall consist of a minimum of five continuous weeks following installation totaling a minimum of 5 weekly composite samples. Each weekly analysis must consist of the entire representative composite samples (one or more) taken that week. Samples should be taken downstream of the installed unit and should not be taken until the unit has reached a "steady state". As in #2 above, these samples will establish a mean weight of discharged mercury (in grams) based on weekly mercury concentrations and discharged water volumes.

6. REPORT TO METRO. Along with the sampling results obtained for each installation, the vacuum drop associated with the amalgam wastewater treatment unit - both objectively (inches of Hg via gauge) and subjectively - must be reported. Further, the transferability of collected sludge and the method of infection control must be explained. Finally, a description of the attention required by the vendor or dentist for proper operation/maintenance must be provided.

Questions regarding these requirements should be directed to Rick Renaud, King County Industrial Waste Investigator, at (206) 689-3007.

* “Typical conditions” include, but are not limited to, the standard practice use of in-line amalgam screens and traps.

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Appendix 4. Recommended Sampling Protocol for Dental Amalgam Wastewater (10/24/94)*

These recommendations are to be used in conjunction with King County's "Demonstration Testing of Amalgam Wastewater Treatment Units". They apply to the sampling of treated and/or untreated dental amalgam wastewater collected after the operatory and before the vacuum pump. The sampling "collector" accumulates all operatory wastewater produced during the week (sample). The total volume is then measured and a representative portion taken for laboratory analysis (subsample).

1. Sampling set-up

- Fittings, tubing and sampler should be installed to avoid rough or low spots where particulate may collect and thus not reach the sampling collector.

2. Sample collection

- To obtain representative samples it is important that there are no major deviations from the typical operatory routine. Do not flush the lines with excess water before or during sampling.
- Most of the metals will be in the particulate matter. Care must always be taken in the collection, splitting and subsampling of samples with particulate to assure that the particulate is evenly distributed so that the sample is truly representative of the wastestream.
- Mix sample within the collector well before subsampling. Cap and invert the collector 8 - 10 times and then swirl while pouring sample(s) to keep the particulate well distributed.
- Pour at least one duplicate sample (for analysis) of untreated wastewater during the first 5-week test period and one duplicate of treated wastewater during the second five-week test period to demonstrate representative splitting technique.
- Measure subsample volume and total sample volume such that sample integrity is maintained.

    - Pour all samples, including duplicate(s) into measured sample bottles (approx. 500 mL).
    - Pour remaining collected sample in a graduated cylinder (approx. 1 - 5 L). Some residue may remain, especially in untreated samples.
    - Rinse particulate residue from the sample collector 2-3 times with a little of the supernatant from the top of the graduated cylinder. Assure that whatever residue film remains is insignificant for volume measurements.
    - Total the volumes: sum the volumes of those samples poured into the sample bottles and the remaining volume poured from the collector into the graduated cylinder. Record total volume.

- Preserve sample(s) with nitric acid to pH<2. Your laboratory may be able to provide this service if sample(s) can be delivered to them immediately.
- Follow the analytical laboratory sample handling procedure.
- Record type and volume of disinfectant used in the dental office.

* This protocol was developed to assure sample integrity and interpretable data and is based upon the 1992/93 Dental Amalgam Separation Study conducted by the Local Hazardous Waste Management Program in King County

3. Analysis

- Notify the laboratory of the type of sample and the anticipated high levels of metals in the untreated wastewater samples (e.g. up to 2000 ppm mercury). High concentration of metals can cause instrumentation contamination and carryover. The laboratory instrument used for mercury analysis has a narrow and very low linear range which likely will require sample dilution at and by the laboratory before analysis.

- The lab should use care in subsampling and dilutions. Dilutions of 1/10,000 or more may be necessary for untreated samples. Digesting the entire submitted sample and then making serial dilutions using digestion acids may be the best approach. The lab's QA/QC data should verify this.

4. Quality Assurance/Quality Control

- Use clean sample bottles of a known volume. Test for contamination. Soak in nitric acid solution, if necessary. Your laboratory may provide appropriate bottles or help in bottle selection.
- Clean the sample collector bottle:
  - Rinse and wash a 4 Liter or larger sample collection bottle.
  - Soak sample collection bottle and lid in disinfectant (Collect a sampler blank to check for possible contamination from the disinfectant; if detected the disinfectant should be changed before sampling begins. Wescodyne seems to work well.)
  - Rinse thoroughly (8x) with warm or hot tap water
  - Rinse 3x with deionized water
  - Shake out and cap bottles
- Use a "new" sample collector after installing the amalgam removal unit. The expected high levels of metals in untreated wastewater will likely contaminate the sample collector used in the first five-week phase of the testing protocol.
- The lab should provide QA/QC information for blanks, standardization, standard reference materials, dilution factors, serial dilution analysis, sample replicates and spikes for every analytical batch (and every ten samples if a batch exceeds ten samples).

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5. Safety

- Untreated dental wastewater must be handled with caution due to its potentially infectious and hazardous characteristics. It is probably prudent to handle according to bloodborne pathogen procedures.

Appendix 5. Tested Amalgam Separators

The Industrial Waste section of King County has received data from the following vendors as evidence that their specified unit is at least 90% effective in removing amalgam from dental wastewater in the Seattle area.

DRNA (tel. 800-360-1001)
Metasys (tel. 905-528-0078)
R&D Services (tel. 206-525-4994)
Rebec (tel. 800-569-1088)
Safety-Kleen (tel. 800-669-5984) approval status unknown at this time.

Note: King County acknowledges that there may likely be several other market-available amalgam separation units or technologies which can meet the minimum 90% removal criteria, but data for these units have not been submitted for our analysis. For example, there were a number of other vendors who began demonstration testing in Seattle but withdrew from the process in response to the county's decision to postpone the dental waste rule promulgation. Contact Rick Renaud (206-689-3007) for more information.

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Appendix 6. Dual Chamber Amalgam Waste Separator

Materials: Fig.

4'' schedule 40 PVC pipe - 2@ 12 inches
4" PVC plug - 2 each
4" PVC coupling - 2 each
4" PVC threaded cap - 2 each
4" PVC male adapter - 2 each
clear silicon caulk - 1 each
baffle: plastic panel (cut from waste basket) - 2 @ 4+" X 12"
PVC glue - 1 each
Nalgene barbed bulkhead fittings (size to fit vacuum hose) - 2 each
vacuum tubing - size to fit operatory, several feet

Cost of Materials: Approximately $60.

Tools:

Electric drill	drill bits:	1/8", 5/8" paddle, 1 1/8" paddle	
Screwdriver	pliers	hand saw	Keyhole saw or similar tool
Utility knife	straight edge	bar clamp	

Assembly (make two):

1. Mount barbed fitting in cap according to instructions. Depending on cap thickness, you may need to recess holes.*
2. Make two shallow cuts at opposing angels along inside length of pipe for baffle. Use jig for straight cut.
3. Cut plastic baffle and pressure fit into slots. Mark location of baffle on outside of pipe.
4. Assemble and glue together PVC parts (except threaded cap.) When assembled, baffle will be several inches above bottom of chamber to allow for sludge accumulation and several inches of headspace at the top of the chamber.
5. Push short piece of hose or other tubing over inside of barbed fittings. The one on the inlet side is to guide wastewater into one of the chambers. A longer one on the outlet side is to extract treated effluent. Hoses must not extend beyond top of baffle.*
6. Screw cap on, noting position of inlet and outlet relative to baffle.
7. Test and seal with silicon caulk as necessary.
8. Insert both units in series in vacuum line between operatory and pump using vacuum hose as needed.

* Alternately, mount one barbed fitting off center in cap for inlet and other barbed fitting near top of pipe for outlet. Special gaskets or shims may be required to fit curved surfaces.

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Dental Office Waste Management: Safety and Regulatory Compliance Issues.

• Regulatory Compliance

• Accreditation & Certification Preparation

• Corporate Compliance

Topics to be covered

• Waste management safety & liability areas of concern in dentistry
• Specific OSHA issues related to waste management
• How to develop your own compliance program

WHAT HAPPENS TO YOUR WASTE?

by MedSafe's Compliance Department

A typical response -"Some guy picks it up, and he takes care of it. What they do with it is their problem!" Unfortunately, it is your problem and the ultimate disposition of waste is your responsibility. The term "Cradle to Grave" is commonly used when discussing regulated waste issues. If you generate regulated waste (sharps, fixer solution, others) you are responsible for it ..forever. It is very important that you check with your waste hauler for appropriate licensing. If your questions are not taken seriously or are responded to in a defensive manner, you might consider looking elsewhere .. there are many!

The following guidelines should be helpful in locating an acceptable Treatment Storage and Disposal Facility (TSDF):

Initial screening

During the initial screening of a TSDF, you should ask for a copy of permits held by the company. It is important to see that the waste hauler has a current permit and is licensed to accept and treat your particular type of waste. This information should be readily available.

You should also ask specific questions concerning qualifications and training of their staff members. Their employees must be trained in Occupational Safety and Health Administration (OSHA), Environmental Protection Administration (EPA), and Department of Transportation (DOT) regulations.

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Your interview should also determine the type of treatment that will be rendered for your particular types of waste. You need to know if your waste will be incinerated or if it will be buried in a landfill--where it can eventually come back to haunt you!

Take the Tour

Consider conducting an on-site tour of the waste facility. While in many cases this may not be practical, you might ask your professional association to go for you. As unexciting as it sounds, it could save you from making a costly mistake. If the waste is not disposed of properly, if it's found washed up on a beach somewhere, you, as the generator of that waste, are the one who pays.

If you visit, you should be interested in seeing the storage and treatment areas of the facility. Assess the geographical location of the facility and its potential ramifications. For example, if it is located in a neighborhood, next to a playground, or near a stream, it is probably not your best choice. It may still be acceptable but there should be an in-depth review of health and safety practices, storage containment and transfer stations, security and warning signs, etc.

Again, appropriate operating permits should be reviewed and copies retained for your files. It is important to know that even though that generator possesses a permit, this does not relieve you of responsibility for proper disposal of your waste. Permits may be expired or revoked. A call to the state licensing authorities is probably well advised.

Financial Resources

Examine the financial health of your waste hauling company. Financial resources need to be adequate in case the waste facility is closed. If it lacks adequate financial resources, the generator--that means you, again--can be tapped for the cost of closure.

Choosing a TSDF requires more study than merely analyzing the cost and frequency of pick-up of your waste. Take a few steps now to minimize your risk. Be wise, be informed, and be responsible.

Waste Management in context...
... how you deal with waste is part of your facility's overall compliance program...

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Safety/Risk Management Program Components

Facility Safety Policy Statement

Hazard Communication and Exposure Control Program
- Program Overview
- Program Summary

The Hazard Communication Plan (HCP)
- Hazard Communication Standard

Hazardous Chemical Inventory Procedure
- Hazardous Chemical Definition

Material Safety Data Sheet (MSDS) Overview

Hazardous Chemical Labeling
- Chemical Labeling Guidelines
- MEDSAFE® Hazardous Material Identification Chart

Exposure Control Plan (ECP)
- Occupational Exposure to Bloodborne Pathogens

Exposure Determination

Epidemiology: Diseases and Symptoms

Universal Precautions

Clinical Protocols
- Standard Operating Procedures (SOP's)
- Handwashing
- Glove Protocol
- Treatment Area Maintenance Protocols
- Laboratory Procedure Protocols
- Housekeeping
  - Protocols for Using Chemical Disinfectants/Sterilants
- Cleaning & Decontamination Protocols
  - Blood Spill Protocols
  - Laundry
  - Waste Management
- Communication of Hazards

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Regulatory and Accreditation Requirements at a glance...

Healthcare Organizations

❑ REGULATORY COMPLIANCE*

❑ **OSHA Compliance**
- On-site Audit of Hazards & Documentation
- Review of Exposure Risks
- Written Report of Recommendations
- Hazard Communication
- Bloodborne Pathogens
- TB Prevention
- Ergonomics
- Lifting Safety
- Air Quality
- **Violence in the Workplace**
- **General Safety**
- Lock Out /Tag Out
- Fire/Electrical Safety
- Quality
- Ladder Safety/Fall Protection
- **MSDS Management**
- **Hazardous Product Labeling System**

❑ **CLIA Compliance**
- On-site Audit with Recommendations
- Procedures Manual Development
- QA/QC Programs
- Initial Staff Training
- Ongoing Program Maintenance

❑ **ADA Compliance**
- Title III, Facilities Audit
- Written Barrier Removal Plan
- Compliance Documentation
- ADA Sensitivity Training

❑ **Controlled Substance Management**
- On-site Audit with Recommendations
- Compliance Documentation
- Initial Staff Training
- Ongoing Program Maintenance

❑ **Multi-Site Safety Management**
- Information and Reporting System

❑ **Program Maintenance**
- Program Updates
- New Hire Training

❑ CORPORATE COMPLIANCE
- Evaluation
- Documentation
- Training
- Fraud & Abuse
- Stark I/StarkII

❑ ACCREDITATION PREPARATION*

❑ **Managed Care Compliance/POC**
- Survey Preparation (JCAHO, AMA, NCQA, AAAHC)
- Utilization Management
- Credentialing
- Preventative Health
- Rights and Responsibilities
- Medical Records
- Quality Improvement
- Practices & Procedures Development

❑ LOSS REDUCTION/RISK MANAGEME

❑ **Employee Policies**
- Employee Handbook
- Harassment Training
- **Violence in the Workplace**

❑ **Due Diligence**
- Purchase/Sale Reporting
- Facility Risk Management

*All programs must be site-specific

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Compliance and Accreditation requirements for Dental and other Healthcare Facilities

General areas to be addressed by a dental organization include the following:

A. Safety and Regulatory Compliance Requirements

Primary Components

1. OSHA Compliance and Hazard Assessment
A thorough review of your facility's practices and procedures, work environment exposure risks and existing risk management/safety programs should be conducted, with formal written recommendations provided to management, to assist in the development and implementation of appropriate corrective actions.

2. Safety Compliance Manuals and Documentation
The organization or facility must develop facility specific Compliance Manuals and documentation including OSHA's Hazard Communication, Bloodborne Pathogens and General Safety standards individualized to each facility plus abstracts and reference materials for relevant regulations. (This could include state mandated X-ray, Chemotherapy, safety committee or other written safety plans as specified.)

3. Material Safety Data Sheet (MSDS) Manuals and Product Labels
A time-consuming, yet critical component of a facility safety program is the assembly of required MSDS Directory and Catalog individualized to your facility, along with labels for all hazardous products transferred to secondary containers.

4. Staff Training
Complete Staff Training should be provided through on-site trainings at your facility, consisting of approximately 3 hours of instruction per session (in satisfaction of OSHA's 29 CFR 1910.1200 and 29 CFR 1910.1030).

5. Ongoing Program Maintenance
The employer must make an ongoing commitment to program maintenance, through (a) continuing documentation updates reflecting new or revised regulations, specific advisories and newsletters, (b) ongoing training availability for new hires, and training for all staff as regulations change, (c) ongoing MSDS acquisition and documentation update, (d) a program of follow-up inspections and site visit reports to management, as well as required annual training of staff and, (e) automatic on-site training in the case of a change in a facility's Program Coordinator.

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B. Accreditation Preparation Requirements

Primary Requirements

1. On-Site Survey and Report
A thorough review of areas important to facility accreditation issues should be conducted, including:

- Office environment
- Practices and procedures
- Appointments and scheduling
- Quality Management
- Medical records
- Policy documentation
- Informed consent, follow-up
- Medication
- Billing and collections
- Safety and infection control
- Contracts
- Termination of care
- Other specialty specific protocol

2. Development of Required Documentation
For any deficiencies identified, physician organization management must then continue with development of required plans and/or practices and procedures (including any plans identified under 'other regulations', see section C below, if necessary).

3. Orientation to Accreditation
Accreditation preparation involves changes in organizational culture and procedure. Facility Coordinator(s) should be designated. These individuals will take a substantial part of their time training staff, and conducting workshop/conferences with management as to performance oriented ongoing responsibilities for accreditation and MCO provider contract maintenance.

4. Ongoing Services
Regulations change, thus the facility Program Coordinator's job description into the future will include revision of plans and/or practices and procedures developed in this MCO/NCQA compliance program as driven by MCO/NCQA initiative.

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C. Other Regulatory Requirements/Suggestions

1. Safety Committee
If not already in place, a safety/accreditation committee provides an excellent vehicle to support ongoing training and program-related implementation issues. SUGGESTION

2. Americans with Disabilities Act (Title III) Compliance
An on-site facility and compliance audit, preparation of barrier removal plan and office policy and ADA awareness training for staff is required for all healthcare facilities.

3. Controlled Substance Management Program
An on-site audit of your facility's degree of compliance with the Federal Controlled Substances Act, written recommendations for corrective measures and a complete training program and manual providing required protocols and documentation should be conducted for all applicable facilities.

4. High Risk TB Exposure Control Plan
A manual based on current CDC recommendations that includes a TB policy, screening and testing procedures, treatment, control measures, recordkeeping forms and the tools for performing a risk assessment should be created, and staff members trained on program components. May be required depending on facility type.

5. Radiation Safety Plan
A plan developed according to specific state laws that describes standard operating procedures, registration requirements, personal protective equipment and barrier requirements, radiation dose limits and monitoring, handling of regulated waste, and provides recordkeeping forms and required postings. May be required depending on facility type.

6. Employee Policies Program
Every facility should develop an Employee Handbook and employee policies covering benefits, work hours, vacations and holidays, sexual harassment, snow days, hiring, disciplinary actions and some 40 other employment related issues. Such a program has been demonstrated to deflect lawsuits and liability exposure.

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Regulatory & Accreditation Readiness Quick-test

Does the facility have a written protocol for an Informed Consent process between the doctor and patient, clearly defining the criteria for when Informed Consent is warranted?	❑ Yes	❑ No
Does the facility have a Chaperone Policy that defines when a chaperone should be offered to a patient?	❑ Yes	❑ No
Does the facility have a Confidentiality Policy defining restrictions on utilizing answering machines when leaving messages for patients?	❑ Yes	❑ No
Does the facility have a *Hazard Communication/ Bloodborne Pathogens manual* customized with facility-specific information?	❑ Yes	❑ No
Does the facility have a written controlled substance (DEA) management program, including accounting controls?	❑ Yes	❑ No
Does the facility have a written Americans with Disabilities Act Barrier Removal Plan? (required by law)	❑ Yes	❑ No
Is there an eyewash, and is it properly mounted and accessible?	❑ Yes	❑ No
Has industrial hygiene and x-ray monitoring been conducted?	❑ Yes	❑ No
Does the facility have a written Employee Policies Manual, including harassment, workplace violence, and discrimination?	❑ Yes	❑ No
Does the facility have a written protocol for surface disinfection?	❑ Yes	❑ No
Does the facility have a written TB Prevention Program	❑ Yes	❑ No
Does the facility make Hepatitis vaccination available to all “at risk” employees, and is this program documented?	❑ Yes	❑ No
Does the facility follow a formal, written Post-Exposure Evaluation and Follow-Up protocol for use in the event of an exposure incident?	❑ Yes	❑ No
Does the office have MSDSs for every product in use, organized for quick access? (Generic, non specific MSDSs do not count!)	❑ Yes	❑ No
Do all secondary containers have appropriate hazard labels, and does labeling system cross-reference with MSDS Book?	❑ Yes	❑ No
Are fire and evacuation plans documented?	❑ Yes	❑ No
Is on-site *job-specific* annual Staff Safety Training provided by a qualified instructor? (required annually by OSHA)	❑ Yes	❑ No

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